

REMARKS

Reconsideration of the March 28, 2003 Official Action is respectfully requested.

The various issues raised in the Official Action are discussed in the order in which they appear in the Official Action.

In response to the objection to the specification, the Abstract of the disclosure has been revised to reflect the claimed V content.

Claims 9 and 11 stand rejected under 35 USC §112, second paragraph, as allegedly being indefinite for the reasons set forth in paragraphs 3-5, on page 2 of the Official Action. Although Applicants do not acquiesce in this ground of rejection, Claims 9 and 11 have been revised to remove the terminology alleged to be indefinite in the Official Action. Such terminology includes "typical" and "type" on line 4 and "apparent" on line 5 of Claim 9 and the term "excellent" on line 2 of Claim 11. In view of the revisions to Claims 9 and 11, withdrawal of this ground of rejection is respectfully requested.

Claims 2, 5 and 9-12 stand rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over Claim 1 of U.S. Patent No. 6,338,764. The reasons for the rejection are set forth in paragraph 7, on page 3 of the Official Action. This rejection is respectfully traversed for the following reasons.

The present application claims the benefit of parent Application Serial No. 09/301,458 which issued as U.S. Patent No. 6,338,764. In the parent application, restriction was required between Groups I-IV on the basis that Group I (Claims 1 and 4) were directed to a hydrogen-absorbing alloy including V in an amount $30 < b \leq 60$; Group

II (Claims 2, 5 and 9) were directed to a hydrogen-absorbing alloy including V in amounts of $0 < b \leq 30$, Group III (Claims 3, 10 and 11) were directed to a hydrogen-absorbing alloy including Mo and/or W rather than V, and Group IV (Claims 12-14) were directed to a cell electrode (see September 29, 2000 Official Action in parent application). In the October 23, 2000 response, Claims 1 and 4 (Group I) were elected and in the December 14, 2000 Official Action, Claims 2, 3, 5, 6 and 9-14 were withdrawn from consideration. In view of the restriction requirement in the parent application, Applicants election of the Group I invention (Claims 1 and 4), and the filing of the present divisional application directed to the Group II invention (Claims 2, 5 and 9), it is submitted that the obviousness-type double patenting rejection in the present application is improper and should be withdrawn.

Claims 2, 5 and 9-12 were rejected under 35 USC §103(a) as allegedly being unpatentable over U.S. Patent No. 5,738,736 ("Tsuji") or U.S. Patent No. 5,501,917 ("Hong"). The reasons for the rejection are set forth in paragraphs 10-13, on pages 4-6 of the Official Action.

Claim 2 sets forth a hydrogen-absorbing alloy comprising a composition expressed by the general formula: $\text{Ti} (100-a-b-c-d) \text{Cr}_a\text{V}_b\text{Ni}_c\text{X}_d$, where X is at least one member selected from the group consisting of Y (yttrium), lanthanoids, Pd and Pt and each of a, b, c and d is represented, in terms of atomic %, by the relations $8 \leq a \leq 50$, $0 < b \leq 30$, $5 \leq c \leq 15$, $2 \leq d \leq 10$ and $40 \leq a + b + d \leq 90$, and a crystal structure of a principal phase which is converted to a body-centered cubic structure by heat treatment. The combination

of features recited in Claim 2 and in the claims dependent thereon are not suggested by Tsuji or Hong.

In the Official Action, it is alleged that Tsuji and Hong "disclose the features substantially as claimed" which can be found at column 2, lines 1-25 and Figures 1-2 of Tsuji and in the Abstract and column 1, line 60 through column 2, line 16 of Hong. The Official Action acknowledges that Tsuji and Hong "do not disclose the claimed heat treatment steps, lattice constant, and capacity retaining ratio after 100 charge/discharge cycles." The Official Action takes the position that the heat treatment steps are met because Tsuji discloses a body-centered cubic structure and takes the position that "the claimed properties such as lattice constant and capacity retaining ratio of charge-discharge cycle are material properties which would have been inherently possessed by the alloy material of cited references" (Official Action at page 5).

Tsuji discloses a hydrogen storage alloy of the Ti-V-Ni system having a body-centered cubic structure, the alloy having the general formula $Ti_x(V_aCr_{1-a})_{1-x}M_bNi_c$ wherein M represents La, Ce or mischmetal and $0.5 \leq a \leq 0.95$, $0.01 \leq b \leq 0.1$, $0.1 \leq c \leq 0.6$ and $0.2 \leq x \leq 0.4$ or the formula $Ti_xV_yM_zNi_{1-x-y-z}$ wherein M represents Co, Fe, Cu and/or Ag and $0.2 \leq x \leq 0.4$, $0.3 \leq y \leq 0.7$, $0.1 \leq z \leq 0.3$ and $0.6 \leq x + y + z \leq 0.95$ (see Abstract of Tsuji). Thus, with respect to the two formulas of Tsuji, the V content is required to be at least 30 atomic % or the V content is a function of the Cr content. Applicants advise that when the V content is 30 atomic % or less as in the hydrogen-absorbing alloy defined by Claim 2, a heat treatment is necessary to insure stable formation of an alloy having a single

body-centered cubic phase. In contrast, when the V content is over 30 atomic %, an alloy having a single body-centered cubic phase can be obtained without heat treatment. Because low V contents in the hydrogen-absorbing alloy of Claim 2 would not provide the body centered cubic structure absent heat treatment, it is submitted that the hydrogen-absorbing alloy according to Claim 2 is not disclosed or suggested by Tsuji.

The hydrogen-absorbing alloy defined in Claim 2 is characterized by a crystal structure of a principal phase which is converted to a body-centered cubic structure by heat-treatment. Tsuji fails to appreciate that alloys having less than 30 atomic % V would not exhibit a body-centered cubic structure unless subjected to heat treatment suitable to provide such body-centered cubic structure. The lack of any recognition in the prior art that such low V alloys would not exhibit a body-centered cubic structure as desired by Tsuji and the lack of any teaching in the prior art as to how to obtain a body-centered cubic structure makes Tsuji non-enabling as to the subject matter of Claim 2. As such, it is submitted that Tsuji clearly fails to suggest the hydrogen-absorbing alloy defined in Claim 2 and in the claims dependent thereon.

Claim 5 depends from Claim 2 and further recites that the heat-treatment comprises solution treatment conducted for 1 minute to 100 hours at a temperature range of from 700 to 1500°C and one or both treatments selected from quenching and aging of from 350 to 1200°C after solution treatment. Tsuji clearly fails to disclose any such heat treatment and cannot possibly suggest the combination of features recited in Claim 5. As explained above, with V contents of 30 atomic % or less it is necessary to carry out a heat treatment

in order to provide a body-centered cubic structure. Tsuji fails to suggest any processing techniques which would provide such lower V-containing alloys with a body-centered cubic structure. Accordingly, it is submitted that the hydrogen-absorbing alloy according to Claim 2 and all claims dependent thereon is clearly patentable over Tsuji.

Hong discloses a hydrogen storage alloy according to the formula $A_aB_bNi_cD_yM_xR_z$ wherein A is at least one of Ti, Zr, Hf, Y, V, Nb, Pd, Mg, Be and Ca, B is one or more of Mg, Al, V, Nb, Ta, Cr, Mn, Si, C, B and Mo, D is one or more of W, Fe, Co, Cu, Zn, Ag, Sb and Sn, M is one or more of Li, Na, K, Rb, Cs, P, S, Sr and Ba, and R is one or more of Sc, Y, La, Ce, Pr, Yb with $0.10 \leq a \leq 0.85$, $0.02 \leq b \leq 0.85$, $0.02 \leq c \leq 0.85$, $0.01 \leq x \leq 0.30$, $0 \leq y \leq 0.25$, $0 \leq z \leq 0.12$ and $a + b + c + x + y = 1$ (see paragraph bridging columns 1-2 of Hong). The large number of choices with respect to the individual elements and the wide ranges of compositions of each component of the alloy is in no way suggestive of the hydrogen-absorbing alloy defined in Claim 2. With respect to the Cr-containing examples of Hong, all of the examples include at least 30 atomic % Ni whereas the hydrogen-absorbing alloy according to Claim 2 includes 5 to 15 atomic % Ni (see Examples 10-12, 15, 22 and 24 of Hong). Further, the V-containing alloys in Table 1 of Hong include at least 30 atomic % V whereas the alloys in Table 2 of Hong are for TiZr alloys of the AB_2 type. Accordingly, it is submitted that Hong clearly fails to suggest the hydrogen-absorbing alloy defined in Claim 2 or in the claims dependent thereon.


It is submitted that the differences between the claimed subject matter and the prior art are such that the claimed subject matter, as a whole, would not have been obvious at the time the invention was made to a person having ordinary skill in the art.

In view of the foregoing, it is submitted that the present application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

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